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AIR MINISTRY M.R.P.104

METEOROLOGICAL RESEARCH COMMITTEE 18 May, 1943

Sub-Committee on Long Range Forecasting, held at Room 110, Bush House, South-East Wing, Aldwych, on Tuesday, 4th May, 1943, at 11.30 a.m. and 2.30 p.m.

Present:

Professor D. Brunt (Chairman)
Mr. E.C. Bilham
Dr. C.E.F. Brooks
Mr. C.K.M. Douglas
Mr. E. Gold
Dr. A.H.R. Goldie
Dr. S. Pettersson
Commander C.T. Suthone, R.N.
Lieut.Commr. Thorpe,R.N.
Mr. J. Wadsworth
Sir Gilbert Walker

1. Morning Session. Review of Long Range Forecasting Trial carried out at Eta, October, 1942, to March 1943.

The Committee had before it M.R.P. 86, 87 and 88, together with a complete set of forecasts issued by the L.R.F. unit, and a set of forecast charts issued, with the corresponding charts of observed pressures. There was also available a series of normal monthly pressures for the months November to April.

Attention was directed to the low correlation between the forecast and observed pressures at certain selected stations, the correlation coefficients being given on p.2 of M.R.P.86, and Mr. Bilham drew attention to the following correlation coefficients between observed and forecast pressure differences -

Azores-Iceland - 0.115
Valentia-Berlin - 0.029
Iceland-Rost - 0.046

The Committee then considered in some detail the forecasts of pressure distribution, and compared them with the observed pressure distribution, and also made a detailed comparison of the forecasts of air mass changes with the observed changes. It was noted that, while a number of the forecasts, especially of air mass changes, appeared to be justified by subsequent events, the results were too uncertain to be of value to the forecaster. On a number of occasions during the trial period the observed pressure distribution was nearer to the monthly mean pressure distribution than to the pressure distribution forecast by the L.R.F. unit, while on some occasions the general wind current over the region of the British Isles was in the opposite direction to the general wind current indicated by the forecast charts. In the forecast charts examined the anticyclone was not usually well located, though it might have been expected that since an anticyclone is a comparatively stable feature of the synoptic chart, not subject to rapid movements of depressions, it would be correctly located in a forecast chart. Mr. Wadsworth expressed the view that the errors in locating the anticyclone are due, at least in part, to errors in the pressures assumed at points in the Atlantic by interpolation over wide areas for which no actual observations are available.

The forecasts issued in this series between Jan.25 and April 19 are given in M.R.P.93. These forecasts cover an interval of 3 to 5 days and sometimes more. They are based mainly on the persistence of existing types, no additional charts of diagrams being specially prepared in connection with their issue.

The Committee agreed that the results were of value, and recommended that the preparation of these forecasts should continue, with the addition of charts of 5-day mean pressures and of upper air data as auxiliaries to the surface synoptic chart.

(f) Medium range forecasting from five-day charts (Rossby's method) M.R.P.96 (Forecast Section, Admiralty)

The paper laid before the committee described the results of an experiment made with Rossby's method, in the Forecast Section of the N.M.S. The average accuracy of the forecasts, as supplied to the Meteorological Officer, Dover, was assessed by him to be 60%.

Dr. Petterssen reported that the initial moderate success of the method in the U.S.A. had not been maintained, and that less attention had been paid to the surface conditions than to those at 10,000 feet, the level of the chart which is the subject of the primary forecast.

After some discussion the Committee expressed the hope that the N.M.S. would continue the experimental trial of forecasts by the Rossby method, and would again report upon it at a later stage.

(g) Note by Dr. Brooks on a revised method of medium range forecasting. M.R.P.94

This note is a brief summary of a lengthy paper by Dr. Brooks, which had not been seen by members of the Committee.

The method proposed is based largely on the existence in the atmosphere of waves of periods, 72, 48, 36, 24, 18 and 12 days. When, say for the 48-day wave, the harmonic analysis is carried out independently for successive intervals of 48 days, it is found that the centre of maximum amplitude is displaced from one 48-day period to the next, while the maximum amplitude is also subject to change. Separate charts are drawn to show the distribution of the coefficients of the cos and sin terms in the harmonic analysis, and Brooks suggests that it will be possible to forecast a value for each of these coefficients for the interval to be covered by the forecast. Since a pressure wave does not persist for many oscillations, as might be expected if the wave were initiated by an impulse or agency which is itself not periodic, if the shorter waves are to be applied in forecasting, they should be derived from observations over a shorter interval prior to that for which the forecast is made, than is used in deriving the longer waves.

Brooks method differs from that of Wadsworth in this respect. He also proposes to combine with the harmonic analysis the use of charts of pressure distribution averaged over 6, 12 and 30 days, and to deduce from this the probable deviations of pressure from the normal in the two succeeding periods of 6 days each. By combination of this with the deductions from the harmonic analysis he proposes to derive a forecast chart for each day. Trial forecasts by this method have proved reasonably successful.

After some discussion the Committee recommended that Brooks' method should be tried for a period of three months, using current information. As however the full memorandum had not been available to

The Committee agreed to recommend that the results of the application of the "symmetry point" method of long distance forecasting, as shownin the documents laid before them, did not justify the continuation of the experiment in the use of the method.

2. Afternoon session. Other possible methods of Long Range Forecasting.

(a) Notes on papers by Krick and Elliott. M.R.P.89

It appeared that no complete account of Krick's method has appeared in any scientific journal, and after a short discussion it was agreed that this method need not be further discussed by the Committee.

Elliott's method might, however, work for short periods, though there might be long intervals of time during which it would fail to yield a forecast. It was recommended that Elliott's paper should be borne in mind, particularly in conjunction with 2 (g) below.

(b) Note on Baur's method of 10-day forecasting. M.R.P.90

The charts and diagrams which form the basis of Baur's method are described in M.R.P.90. Doubt was expressed as to whether Baur's forecasts are in reality made by the method outlined in his published papers. Page and Clapp, in Monthly Weather Review Supplement No.39, have estimated the percentage success of Baur's forecasts as 75% for the first 5 days, and 53% for the last 5 days, of the forecast period.

The Committee agreed that Baur's method need not be further considered, but that one feature of the method, the use of upper air data, should be brought into consideration in any scheme of forecasting for medium ranges of time. It was suggested that the upper air data to be considered would be those for the upper two-thirds of the troposphere, and for the lower stratosphere, up to about the level of about 300 mb.

(c) Note on the results of statistical forecasts. M.R.P.91

Two methods are discussed in M.R.P.91. It is shown that sequences of charts similar to the current charts, even when they have persisted for as long as 20 days, may be reversed within the next 10 days, and cannot therefore be used as a basis for long range forecasts. It is also shown that assuming the normal pressure distribution as an approximation to the three-day mean, yields results of no value in practical forecasting.

(d) Forecasting by pressure anomalies and trends. M.R.P.92

This method depends on finding earlier periods during which the distribution of pressure anomalies is closely similar to that preceding the interval for which a forecast has to be made, together with an examination of the trends of the changes in the average pressure distribution shown on charts for consecutive intervals of 10 days.

The Committee did not regard the results as being in a form capable of direct application. They agreed, however, that there is room for experiment with charts of average pressures for periods of about 5 days, to be used in conjunction with the current synoptic chart, and recommended that mean charts for the shorter period should be used in preference to those for 10 days.

(e) Period forecasts based on synoptic sequences, issued by the Central Forecasting Station of the Meteorological Office. M.R.P.93

the members of the Sub-Committee, they expressed the hope that Sir Gilbert Walker should agree to examine it so that the Meteorological Research Committee might have the results of his examination before then in considering this recommendation of the Sub-Committee. Sir Gilbert Walker agreed to make the examination.

The Committee rose at 5.50 p.m.